

UNIVERSITY OF KALYANI

**SYLLABUS FOR THREE-YEAR B. Sc. GENERAL DEGREE
COURSE IN**

STATISTICS

(Part I, Part II & PART III)

WITH EFFECT FROM THE ACADEMIC SESSION 2016-2017

UNIVERSITY OF KALYANI

SYLLABUS FOR THREE-YEAR B. Sc. GENERAL DEGREE COURSE IN STATISTICS

Examination	Paper	Full Marks	Duration
Part I	Paper I (Theory)	100	3 hours
Part II	Paper II (Theory)	100	3 hours
	Paper III (Prac., based on Papers I & II)	100*	4 hours
	* Note Book (10) + Viva-voce (10)		
Part III	Paper IV (Theory)	60	3 hours
	Paper V (Prac., based on Paper IV)	40*	2 hours
	* Note Book (5) + Viva-voce (5)		

DETAILED SYLLABUS

PART I

Paper I (Theoretical)

Probability I:

Random experiments and random events, statistical regularity and meaning of probability, classical definition of probability, conditional probability, independence of events, principal theorems including theorems on the union and intersection of events, random variable, probability mass and probability density functions, mathematical expectation and variance.

Theoretical Distributions:

Discrete uniform, hypergeometric, binomial, Poisson, rectangular and normal distributions with their uses.

Descriptive Statistics I:

Compilation, classification, tabulation and diagrammatic representation of statistical data, frequency distribution and its graphical representation, frequency curve, measures of central tendency and dispersion, moments, measures of skewness and kurtosis, bivariate frequency distribution, correlation and regression, Spearman's rank correlation (untied case).

Numerical Analysis:

Δ and E operators, interpolation formulae: Newton's forward formula, Lagrange's formula.

Numerical solution of equations in one unknown – method of bisection and method of iteration, numerical integration – trapezoidal and Simpson's 1/3 rd rules.

Economic Statistics:

Construction and uses of price index numbers, consumer price index number.

Analysis of Time Series:

Different components of a time series, determination of trend by free-hand smoothing, method of moving averages and by fitting of mathematical curve by the method of least squares.

PART II

Paper II (Theoretical)

Probability II:

Joint distribution of two random variables, marginal and conditional distributions, covariance. Theorems on expectation and variance of a sum of random variables and product of independent random variables, statement of the general properties of a bivariate normal distribution, Chebyshev's inequality and its application to Weak Law of Large Numbers, Central Limit Theorem – Lindeberg-Levy theorem (without proof) and its use.

Sampling Distribution:

Population and sample, parameter, statistic, random sampling and sampling distribution, standard error, definition and properties of χ^2 , t and F (without proof), distribution of sample mean and sample variance under normal setup (statement), use of χ^2 , t and F statistics.

Point Estimation:

Requirements of a good estimator (unbiasedness, minimum variance, consistency and efficiency), methods of estimation – method of moments and maximum likelihood, applications of the methods in finding estimators of parameters of binomial, Poisson and normal (univariate) distributions, unbiasedness (or otherwise) and standard error of these estimators.

Hypothesis Testing:

Null and alternative hypotheses, two kinds of errors, critical region, level of significance and power of a test, exact tests under normal setup for single mean, the difference of two means (uncorrelated case), single variance, the ratio of two variances (uncorrelated case) and simple correlation ($H_0 : \rho = 0$).

Interval Estimation:

Confidence interval and confidence coefficient, exact confidence interval under univariate normal setup for mean and variance.

Analysis of Variance:

Statement of F test for testing linear hypotheses, one-way classified data and two-way classified data with one observation in each cell.

Design of Experiments:

Basic principles of a design – randomization, replication and local control, Completely Randomized Design (CRD), Randomized Block Design (RBD) and Latin Square Design (LSD), technique of Analysis of Variance with reference to the analysis of above designs.

Sample Survey I:

Population, sampling unit, sampling frame, sample, sample survey versus complete enumeration, sampling and non-sampling errors, concepts of random numbers and their uses, random sampling, SRSWR, SRSWOR, estimation of population mean and population total with their estimates of standard errors.

Paper III (Practical)

Based on Paper I & Paper II

PART III

Paper IV (Theoretical)

Descriptive Statistics II:

Multiple linear regression involving two independent variables, partial and multiple correlation coefficient involving three variables.

Large Sample Theory:

Large sample tests for proportion, mean, variance and simple correlation coefficient (normal setup), large sample tests for homogeneity and independence in a contingency table (without proof).

Design of Experiments II:

Factorial experiments, main effects and interactions in 2^2 and 2^3 experiments, analysis of 2^2 and 2^3 experiments conducted in RBD, notion of confounding.

Sample Survey II:

Stratified random sampling, estimation of population mean with estimation of its s.e., allocation of sample size (proportional and Neyman's allocation).

Vital Statistics:

Measurement of mortality: crude, specific and standardized death rates, complete life table, measurement of fertility and reproduction: crude birth rate, general, age-specific and total fertility rates, gross and net reproduction rates.

Statistical Quality Control:

Concepts of product and process control, rational subgroups, underlying theory of control charts, control charts for attributes: p, np and c charts, control charts for variables, X-bar and R charts. Principles of acceptance sampling, problem of lot acceptance: AQL and LTPD, producer's risk and consumer's risk, description of single sampling inspection plans for attributes, performance of the plan in terms of Average Total Inspection (ATI), ASN and AOQL.

Paper V (Practical)

Based on Paper IV

References:

1. Gun, A. M., Gupta, M. K. & Dasgupta, B.: Fundamentals of Statistics, vol I & II, World Press.
2. Gun, A. M., Gupta, M. K. & Dasgupta, B.: An Outline of Statistical Theory, vol I, World Press.
3. Scarborough, J. B.: Numerical Mathematical Analysis. Oxford University Press.

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